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First record of *Diphya wulingensis* Yu, Zhang et Omelko, 2014 (Aranei: Tetragnathidae) in Russia

Первая находка *Diphya wulingensis* Yu, Zhang et Omelko, 2014 (Aranei: Tetragnathidae) в России

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KEY WORDS: Araneae, Diphyinae, Metainae, Tetragnathinae, redescription, China, Maritime Province, distribution.

КЛЮЧЕВЫЕ СЛОВА: Araneae, Diphyinae, Metainae, Tetragnathinae, переописание, Китай, Приморский край, распространение.

ABSTRACT. A previous record of *Diphya* sp. from the Russian Far East is found to refer to *Diphya wulingensis* Yu, Zhang et Omelko, 2014, the northernmost species of the genus. The species is redescribed and illustrated, and its copulatory organs are described in detail. Distribution records of the species are provided on a map, and the taxonomic position of *Diphya* and its relationships to other species are briefly discussed.

РЕЗЮМЕ. Показано, что находки *Diphya* sp. с Дальнего Востока России относятся к *Diphya wulingensis* Yu, Zhang et Omelko, 2014 самому северному виду рода. Даны иллюстрации вида и подробное описание копулятивных органов. Находки вида показаны на карте. Коротко обсуждается положение *Diphya* в семействе и таксономические связи видов из разных регионов.

Introduction

Diphya Nicolet, 1849 is relatively small genus of tetragnathid spiders with 14 named species [Marusik, 2017]. It has an unusual distribution: southernmost South America, eastern Brazil, South Africa, Madagascar, Eastern China, Taiwan, Japan [Marusik, 2017] and the southern part of the Russian Far East [Marusik, Kovblyuk, 2011]. Although the genus has been reported from Russia, the species is unidentified (thought to be undescribed), and exact collecting localities were not mentioned in Marusik & Kovblyuk [2011]. The study of all available material from the Russian Far East reveals only one species of *Diphya* which was recently described from Northeastern China, *D. wulingensis* Yu, Zhang et Omelko, 2014. It is worth noting that *D. wulingensis* was already the northernmost species of the genus, and our finding extends the known range more than 4° north. The goal of this paper is to provide a detailed illustrated redescription of the species and to comment on the taxonomic position of the genus within Tetragnathidae.

Material and methods

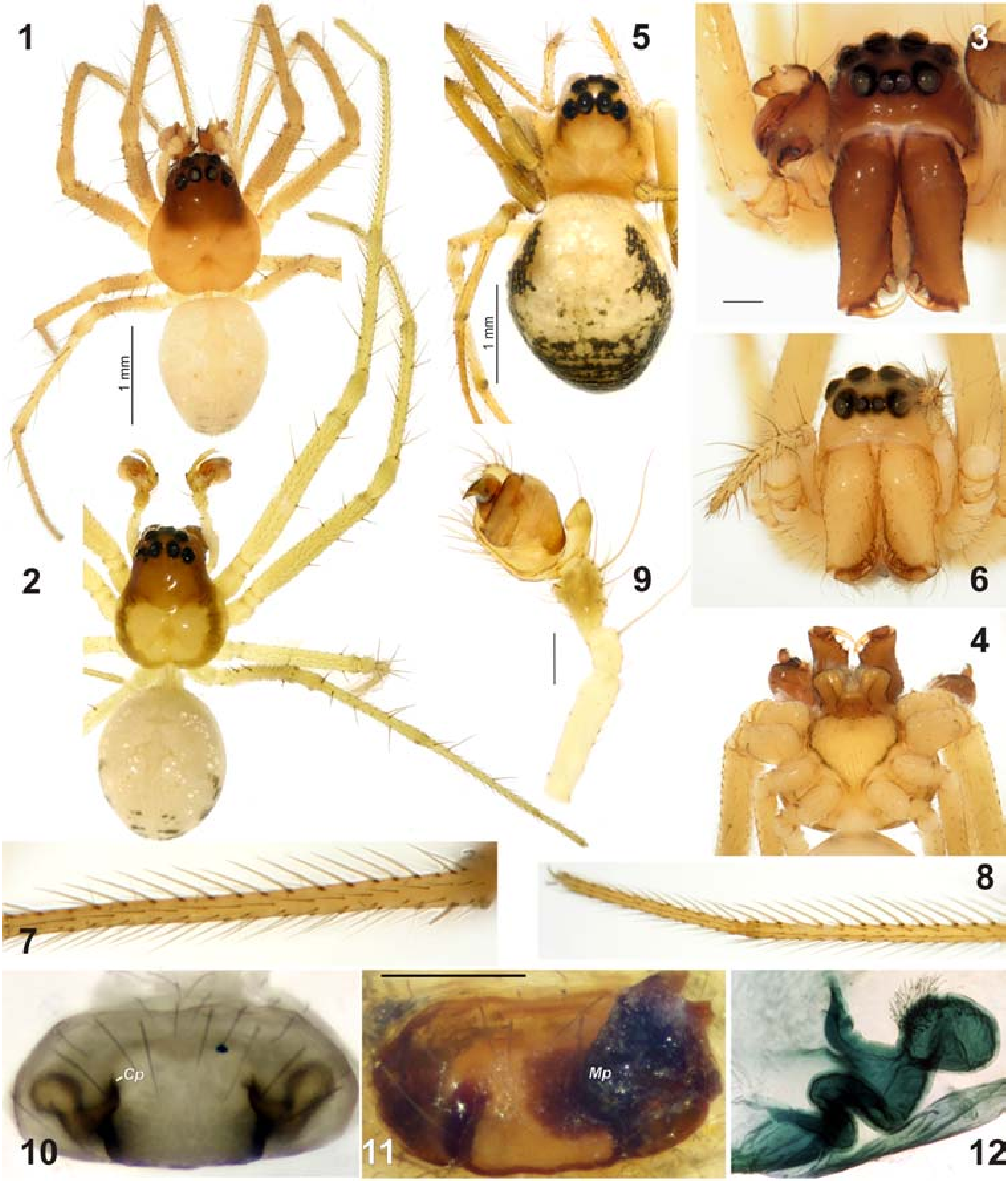
Specimens were photographed with a Canon EOS 7D camera attached to an Olympus SZX16 stereomicroscope and with a SEM JEOL JSM-5200 scanning microscope at the Zoological Museum, University of Turku, Finland. Digital images were montaged using CombineZP image stacking software. The epigyne was cleared in a KOH/water solution until the soft tissues were dissolved. Photographs were taken of the specimens in dishes with cotton paraffin on the bottom to hold them in position. All specimens will be deposited in the Zoological Museum of Moscow State University. All measurements are in mm.

Taxonomy

***Diphya* Nicolet, 1849**

Diphya Nicolet, 1849: 406; Simon, 1894: 744; Tullgren, 1902: 24; Tanikawa, 1995: 102; Álvarez-Padilla, Hormiga, 2011: 756.

Type species. *Diphya macrophthalma* Nicolet, 1849 from Southern Chile. Although the species was de-

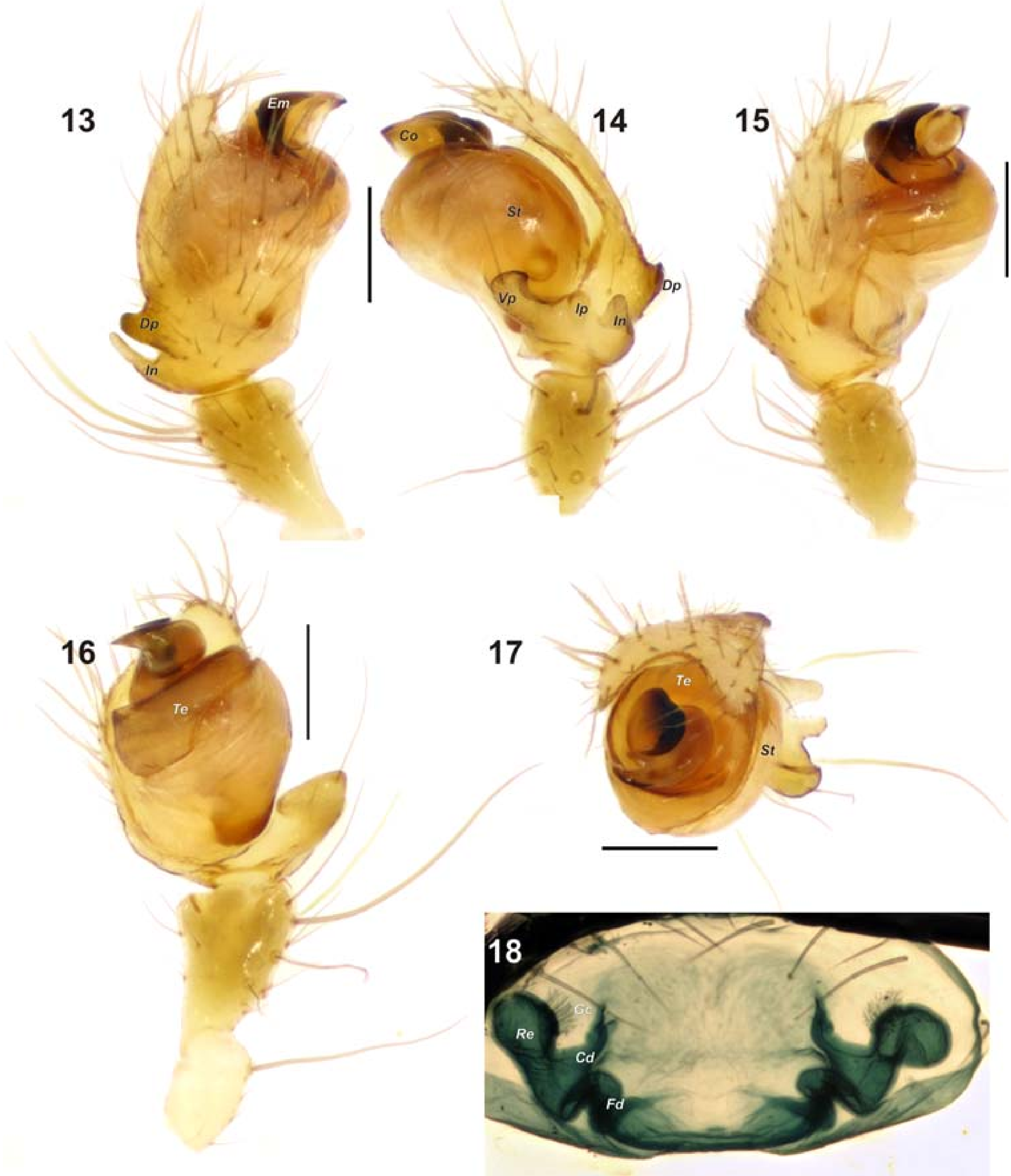


Figs 1–12. *Diphya wulingensis*: 1–2 — male habitus, dorsal; 3, 6 — male and female prosoma, frontal; 4 — male prosoma, ventral-caudal, showing sternum and mouthparts; 5 — female habitus, dorsal; 7 — male metatarsus I, dorsal; 8 — male metatarsus and tarsus I, dorsal; 9 — male palp, retrolateral; 10 — dissected epigyne, ventral; 11 — intact epigyne with mating plug, ventral; 12 — macerated epigyne, dorsal. Scale = 0.2 mm unless otherwise indicated.

Abbreviations. *Cp* — copulatory openings, *Mp* — mating plug.

Рис. 1–12. *Diphya wulingensis*: 1–2 — внешний вид самца, дорзально; 3, 6 — самец и самка головогрудь, спереди; 4 — самец головогрудь, вентро-каудально, показаны стернум и ротовой аппарат; 5 — внешний вид самки, дорзально; 7 — предлапка I самца, дорзально; 8 — предлапка и лапка I самца, дорзально; 9 — пальпа самца, ретролатерально; 10 — отделённая эпигина, вентрально; 11 — эпигина с затычкой, вентрально; 12 — мацерированная эпигина, дорзально. Масштаб 0,2 мм, если не указано иное.

Сокращения. *Cp* — копулятивные отверстия, *Mp* — затычка.

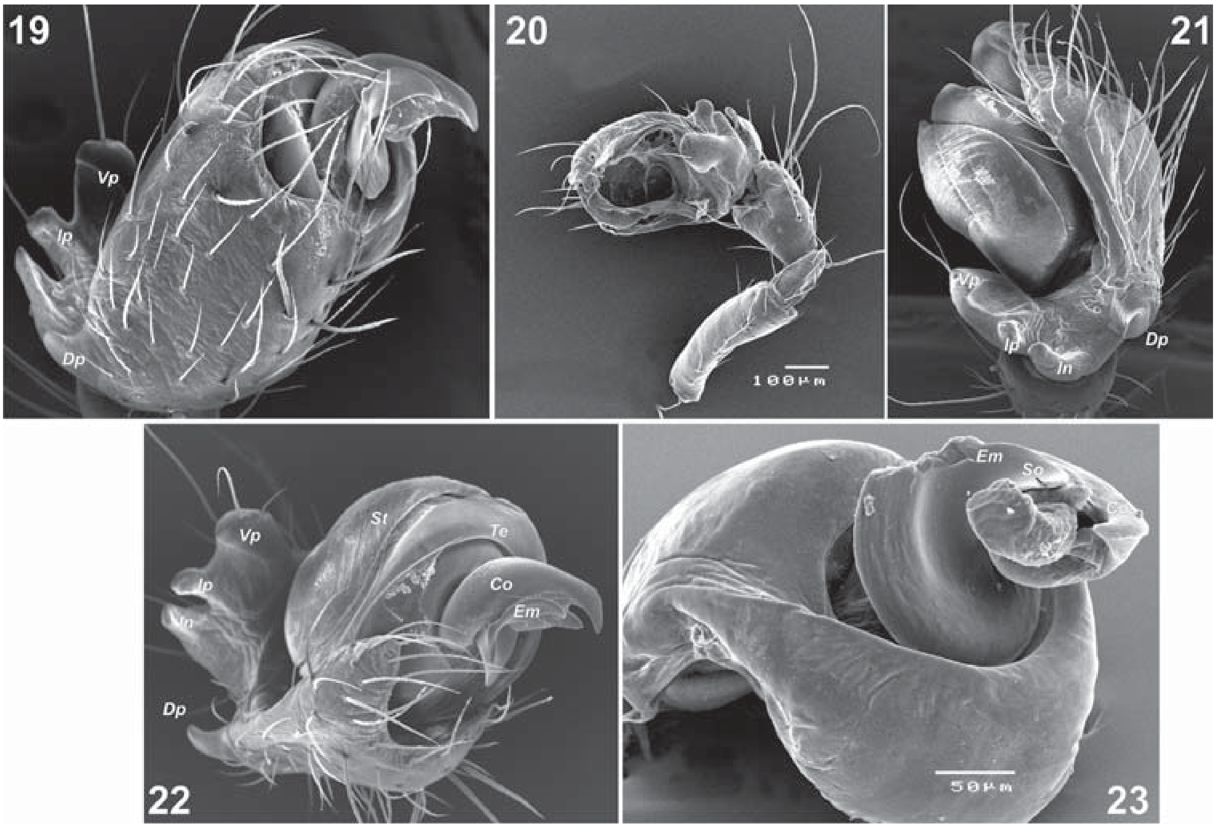


Figs 13–18. Male palp and epigyne of *Diphya wulingensis*: 13 — male palp, dorso-prolateral; 14 — same, retrolateral; 15 — same, prolateral; 16 — same, ventral; 17 — same, anterior; 18 — epigyne, dorsal, photographed at higher magnification. Scale = 0.2 mm unless otherwise indicated.

Abbreviations. *Cd* — copulatory duct, *Co* — conductor, *Em* — embolus, *Dp* — dorsal process, *Fd* — fertilization duct, *Gc* — glandular cilia, *In* — ventral intermediate process, *Ip* — dorsal intermediate process, *Re* — receptacles, *St* — subtegulum, *Te* — tegulum, *Vp* — ventral process.

Рис. 13–18. Пальпа самца и эпигина *Diphya wulingensis*: 13 — пальпа самца, дорзо-пролатерально; 14 — тоже самое, ретролатерально; 15 — тоже самое, пролатерально; 16 — тоже самое, вентрально; 17 — тоже самое, спереди; 18 — эпигина, дорзально, снято на большем увеличении. Масштаб 0,2 мм.

Сокращения. *Cd* — семяпровод, *Co* — кондуктор, *Em* — эмболюс, *Dp* — дорзальный отросток, *Fd* — оплодотворительный канал, *Gc* — волоски желёз, *In* вентральный средний отросток, *Ip* — дорзальный средний отросток, *Re* — рецептакулы, *St* — субтегулум, *Te* — тегулум, *Vp* — вентральный отросток.



Figs 19–23. SEM microphotographs of male palp of *Diphya wulingensis*: 19 — dorsal-anterior; 20 — whole palp with removed bulb, ventro-retrolateral; 21 — retrolateral, 22 — anterior; 23 — tegulum and embolic division, dorsal.

Abbreviations. *Co* — conductor, *Dp* — dorsal process, *Em* — embolus, *In* — ventral intermediate process, *Ip* — dorsal intermediate process, *So* — sperm duct opening, *St* — subtegulum, *Te* — tegulum, *Vp* — ventral process.

Рис. 19–23. СЭМ микрофотографии пальпы самца *Diphya wulingensis*: 19 — сверху-спереди; 20 — целая пальпа без бульбуса, вентро-ретролатерально; 21 — ретролатерально, 22 — спереди; 23 — тегулум и эмболюсный отдел, дорзально.

Сокращения. *Co* — кондуктор, *Dp* — дорзальный отросток, *Em* — эмболюс, *In* — вентральный средний отросток, *Ip* — дорзальный средний отросток, *So* — отверстие семявыводящего канала, *St* — субтегулум, *Te* — тегулум, *Vp* — вентральный отросток.

scribed based on both sexes, the male has never been illustrated.

Diagnosis. *Diphya* is well differentiated from all other tetragnathids by having enlarged lateral and posterior median eyes, much larger than the anterior median eyes (Figs 1–3, 5–6), widely spaced lateral eyes (the character is also known in a few *Tetragnatha* species) and a prolateral row of stiff setae on the tibia-tarsus of legs I and II (Figs 7–8).

Description. The genus is well described in Tanikawa [1995] and Álvarez-Padilla & Hormiga [2011].

Relationships. Although Simon [1894] placed *Diphya* in Diphyeæ Simon, 1894, more recent analyses subsequently placed it in Tetragnathinae [Álvarez-Padilla, 2007] and then in Metinae [Álvarez-Padilla *et al*., 2009]. The most recent analysis leaves it unplaced [Álvarez-Padilla, Hormiga, 2011]; however, for reasons unknown, Diphyeæ as a separate group was not considered or even mentioned in these three most recent analyses. However, in this study we found *Diphya* to be well separated from all currently recognized subfamilies of Tetragnathidae: Leucauginae, Metainae, Nanometinae and Tetragnathinae based on both somatic morphology and characters of the copulatory organs.

Based on the shape of the male palp, African [Marusik, 2017], Asian and South Neotropical species of *Diphya* are distantly related and may be considered separate genera in the future. Males of two species from Chile (found in the same region as *D. macrophthalma*, but the male is not properly described), *D. spinifera* Tullgren, 1902 and *D. limbata* Simon, 1896 (see figs 23–26 in Tanikawa [1995]) have a palpal tibial apophysis, a character lacking in Asian species and known only in one Tetragnathidae genus, *Homalometa* Simon, 1898.

Note. Simon's name Diphyinae is already preoccupied in Cnidaria by Diphyinae Quoy et Gaimard, 1827, and we are applying to the International Commission on Zoological Nomenclature to change Simon's name to Diphyainae.



Fig. 24. Distribution records of *Diphya wulingensis*.
Рис. 24. Находки *Diphya wulingensis*.

Diphya wulingensis Yu, Zhang et Omelko, 2014
Figs 1–24.

Diphya sp.: Marusik, Kovblyuk, 2011: 235, f. 34.6–9 (♂♀).

Diphya wulingensis Yu, Zhang, Omelko, 2014: 31, f. 1–13 (♂♀).

Material examined: RUSSIA, ***Maritime Prov***.: 1 ♂ (ZMMU), Khanka Lake, S Shore, Luzanova Sopka, 44°33′N 132°23′E, 16–17.07.1998 (Yu.M. Marusik); 1 ♂ 1 ♀ (ZMMU), Lazovski Reserve, Korpad Camp, 43°16′N 134°08′E, 6–9.08.1998 (Yu.M. Marusik); 1 ♂ (ZMMU), Lazovski Reserve, Syaukhe (=Sokolovka) River valley, forest opening, among herbs, 19.08.1981 (T.I. Oliger); 1 ♂ (ZMMU), Ussuriysk Dist., Gornotaezhnoye, broadleaf forest, meadow, 9–19.07.1990 (A.V. Tanasevitch); 1 ♀ (ZMMU), Uglovoye (suburb of Artyom Town), 43°21′N 132°03′E, 4.10.1997 (Yu.M. Marusik); 1 ♂ (ZMMU), Khasanskiy Dist., Kedrovaya Pad' Reserve, valley broadleaf forest, 13.08.1977 (B.P. Zakharov); 2 ♀♀ Khasanskiy Dist., Kruglaya Bay near Nerpa Vill., ca. 8 km S of Slavyanka Vill., oak forest, litter, 7.08.1998 (E.V. Mikhaljova).

Diagnosis. *Diphya wulingensis* well differs from all Asian species by colour pattern, shape of copulatory organs and microstructure of the carapace. Unlike *D. albula* (Paik, 1983) it has no fine pits on carapace. Males of *D. wulingensis* have darkened anterior half of carapace (character lacking in other species). Male palp with complex paracymbium having 4 processes (other species have simple unbranched paracymbium and cymbial process). Epigyne in *D. wulingensis* is lacking fovea, which is present in all Asian species, and in addition receptacles in *D. wulingensis* are spaced by more than one diameter vs. spaced by less than half diameter in other Asian species.

Description. For a description of somatic characters, see Yu *et al.* [2014]. The carapace pattern in the male is variable; some specimens have a sublateral dark band (Fig. 2) and some do not (Fig. 1). The male palp is as in Figs 9, 13–17, 19–23: femur as long as patella + tibia, tibia longer than wide; paracymbium complex, with 4 processes, ventral process (*Vp*) large, with 2 macrosetae on the tip, ventral intermediate process (*In*) small, digitiform, dorsal intermediate process (*Ip*) originates from base of cymbium; dorsal process (*Dp*) with sclerotized tip; cymbium concave prolaterally (Fig. 19); subtegulum (*St*) large, obscuring tegulum in retrolateral view; tegulum (*Te*) circular, conductor (*Co*) laminar, twisted around axis, bifid in terminal part (Figs 17, 22); embolus (*Em*) short, twisted together with conductor, sperm duct opening (*So*) small (Fig. 23).

Epigyne as in Figs 10–12, 18, epigynal plate about 2 times wider than long, fovea absent, median plate wide (0.5 of the plate width), 2 times wider than long; copulatory openings (*Cp*) indistinct; receptacles (*Re*) globular, separated by 4 diameters, mesal part with long glandular cilia (*Gc* or accesorial glands *sensu* Álvarez-Padilla & Hormiga [2011]), fertilization ducts (*Fd*) longer than copulatory duct (*Cd*).

Note. We were unable to distinguish an epigynal septum as shown on the line drawing of the paratype of *D. wulingensis* (fig. 8 in Yu *et al*. [2014]). The septum is lacking on the photograph (figs 3–4 in Yu *et al*. [2014]). The figures of the endogyne in this paper (Figs 12, 18) and in Yu *et al*. [2014: fig. 9] slightly differ because of the angle in which they were illustrated. One female examined here has a mating plug in the epigyne (Fig. 11). This plug consists of part of the conductor.

Distribution. *Diphya wulingensis* is known from the northeastern part of Hebei Province and in southern part of Maritime Province of Russia (Fig. 24). The record from Khanka Lake is the northernmost of the entire genus.

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